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Figures 1 and 2, Plate XII., are photographs of longitudinal and cross-sectional views, respectively, of the animal. Figures 3 and 4, Plate XII, are diagrams simplifying and interpreting the former figures. From these the main details of the anatomy can be made out.

The twin individuals arise apparently by binary division of the parent. Further multiplication is by motile gametes, which bud from the adult. These arise in a string and suggest ova in higher animals.

The oval cilia are not in a wreath form, but line the gullet into which they are retracted when not in use.

The body wall contains fibrils similar to those found in the Vorticellidæ.

4. PROCYTOS VULGARIS; AN INORGANIC CELL

There is a question which often comes into the mind of students of cytology: "Where does the cell form come from? What was its origin and what relation does it bear to organic and inorganic nature?"

There is a growing number of students of natural phenomena who are diligently striving to show the relations of the organic world to the inorganic. To such the following study may be of interest.

A look at the photo (Plate XII., Fig. 5), which I have called *Procytos vulgaris,* shows a cell structure which bears a striking resemblance to many animal and plant tissues.

Here are to be found wholly inorganic formations which suggest cells with cell walls, nuclei, nucleoli, filaments and cyto-plasm bodies. These structures are purely inorganic and can be produced in the liquid form of any material, by observing certain conditions of temperature.

The material used in the present experiment is ozokerite, a refuse product from oil refineries in the form of wax. If this is melted and poured on a hot plate and allowed to cool slowly we get the effect pictured above.

The Giant's Causeway in Ireland is a somewhat similar production on a large scale, in an ancient outpoor of lava or melted rock.

The cells are centers of boiling by which heat is conducted from the base to the air, where the material is cooled and then moves downward again.

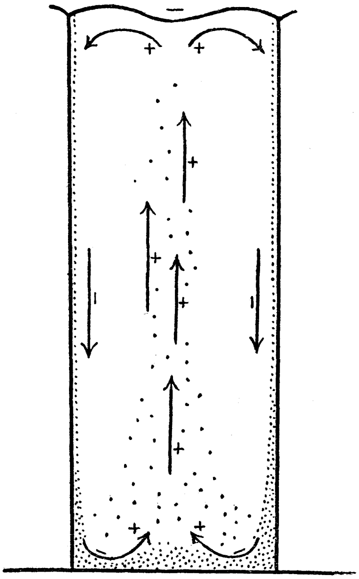


Diagram of Circulation in the Inorganic Cell

By consulting the diagram there will be seen two streams of fluid of opposite polarity. One stream of positive heat units goes upward in the center of the cell while the cooled units descend at the margin. Particles of various kind which may be in the fluid are carried along by the movements of the streams.

This boiling is easily seen in the fluid preparation as long as the material stays within a certain range of temperature.

The cells should in theory be correct hexagons, but some cells are more vigorous in action than others, resulting in the encroachment on the domain of other cells, thus deforming them.

The descending streams of cooled units deposit particles of various materials in the cell walls where they are cemented up by congelation into substantial walls.

The nucleus-like spots are caused by introducing bodies that do not readily mix with the wax—in this case air bubbles. These become the center of a secondary activity. When the cooling has progressed far enough they collapse, forming the crater-like circles in the cells. The nuceoli are secondary eruptions of the air.

The markings within, which suggest cytoplasm, are caused by crystals of some fat which solidifies at a temperature different from the mass with which it is mixed.

Now, let us compare this structure with the similar characters of living cells and see wherein they both show dependence on natural conditions. First, we have here in both cases a definite enclsoure of certain activities. In both cases one form of this activity is heat; only within certain bounds of temperature are the activities of either possible. With the lowering of the temperature the components congeal, with the raising they disintegrate.

Second, the cells are rudely hexagonal in form. This follows from the association of semi-fluid bodies, their mutual pressure determining their shape.

Third, the formation in both cases, by precipitation, due to congelation or other process, of cell walls at the boundaries of the cell.

Fourth, a definite circulation of the cell contents which lasts as long as the components are in their requisite relations.

This may be plainly seen in plant cells where the protoplasm streams outward from the nuclei, bathing the cell wall on the side toward the source of heat and returning to the nuclei on the cooled wall.

Fifth, the formation of nuclei of substances of a nature different from that of the surrounding material, which results in definite secondary activities of a complicated kind.

Sixth, the precipitation and coagulation of various substances in the cytoplasm when they reach critical temperature points.

We thus see that there are structures and functions which occur in both the organic and inorganic world in quite similar ways. It is quite impossible to escape the conviction that forces that act in the one are also real causes in the other.

It is not pretended that the processes in this inorganic material are identical with those in the living cell, nor that temperature is the only factor in organic activity.

There are many types of fluid-formed crystals now known; some 300 or more. These are molecular arrangements of inorganic substances. Modern theories of crystal formation point to a fluid pre-crystal stage in which the components are adjusted into the relations in which they congeal.

When more definite studies of pre-crystal stages are to be had, we do not doubt that conditions similar to these we have described in this inorganic cell will be found.

Battle Creek, Mich. E. W. ROBERTS.

EXPLANATION OF PLATES

PLATE X—Rhizopods of Michigan

Fig. 1. *Arcella vulgaris;* constrictions of chromidial net into gametes.

FIG. 2. *Arcella vulgaris;* network matured into gametes.

FIG. 3. *Arcella vulgaris;* escaping gametes have left scars.

FIG. 4. *Arcella vulgaris;* asexual individual.

FIG. 5. *Clathrulina;* adult asexual form.

FIG. 6. *Clathrulina;* resting spore stage, also asexual.

PLATE XI—Nature of Olfactory Organs

FIG. 1. Antennæ of Black Syrphus Fly.

FIG. 2. Section of sensory pit in Sarcophaga.

FIG. 3. Section of palpus of *Pieris raphae.*

FIG. 4. Section of antenna of Honey Bee.

FIG. 5. Cross-section of olfactory pits on antenna of Vespa.

PLATE XII

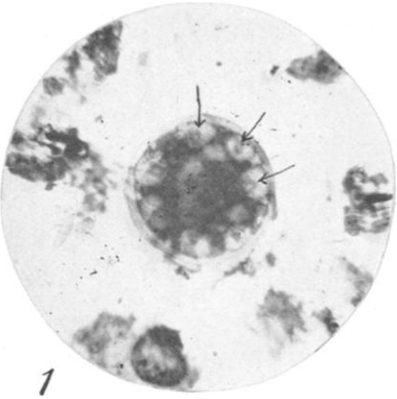
FIG. 1. *Vaginicola;* photograph of longitudinal section.

FIG. 2. *Vaginicola;* photograph of cross-section.

FIG. 3. Diagram of details in Fig. 1: A, sheath; B, aperture of same; C, the individual animal; D, nuclei (macro and micro); E, gametes; F, fibrils in ectoderm.

FIG. 4. Diagram of details in Fig. 2. Lettering as in Fig. 3.

FIG. 5. Photograph of ozokerite cooled in such a way as to suggest cells.



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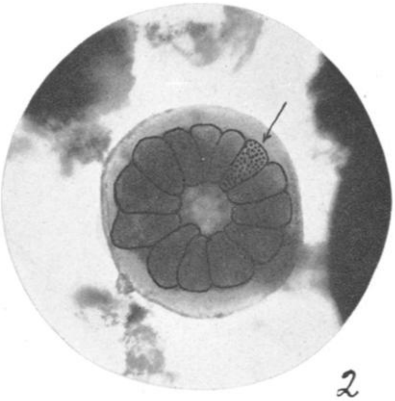

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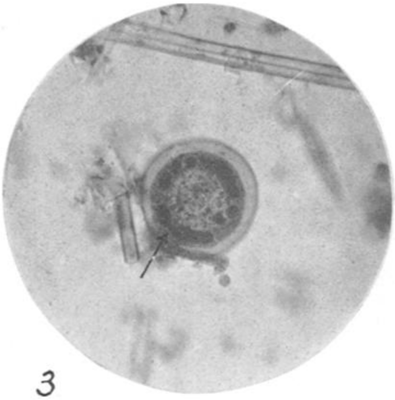

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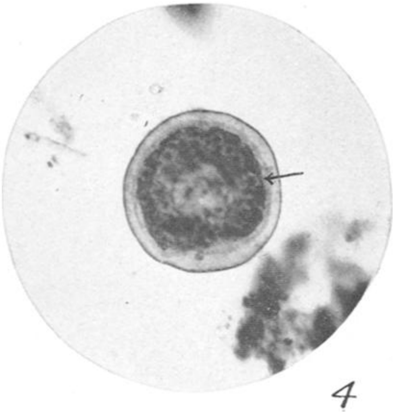

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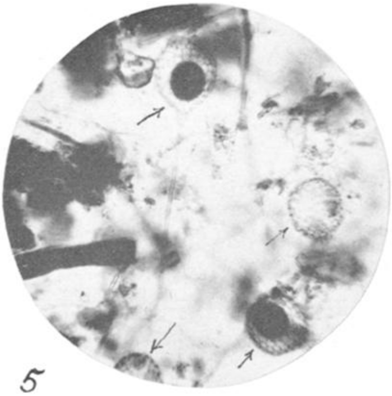

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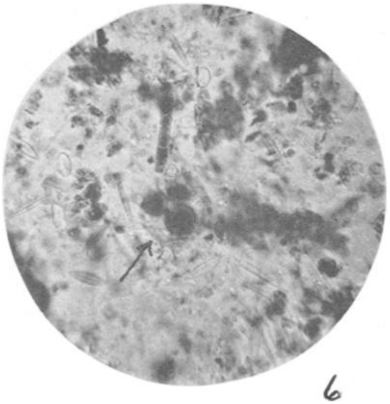

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PLATE X

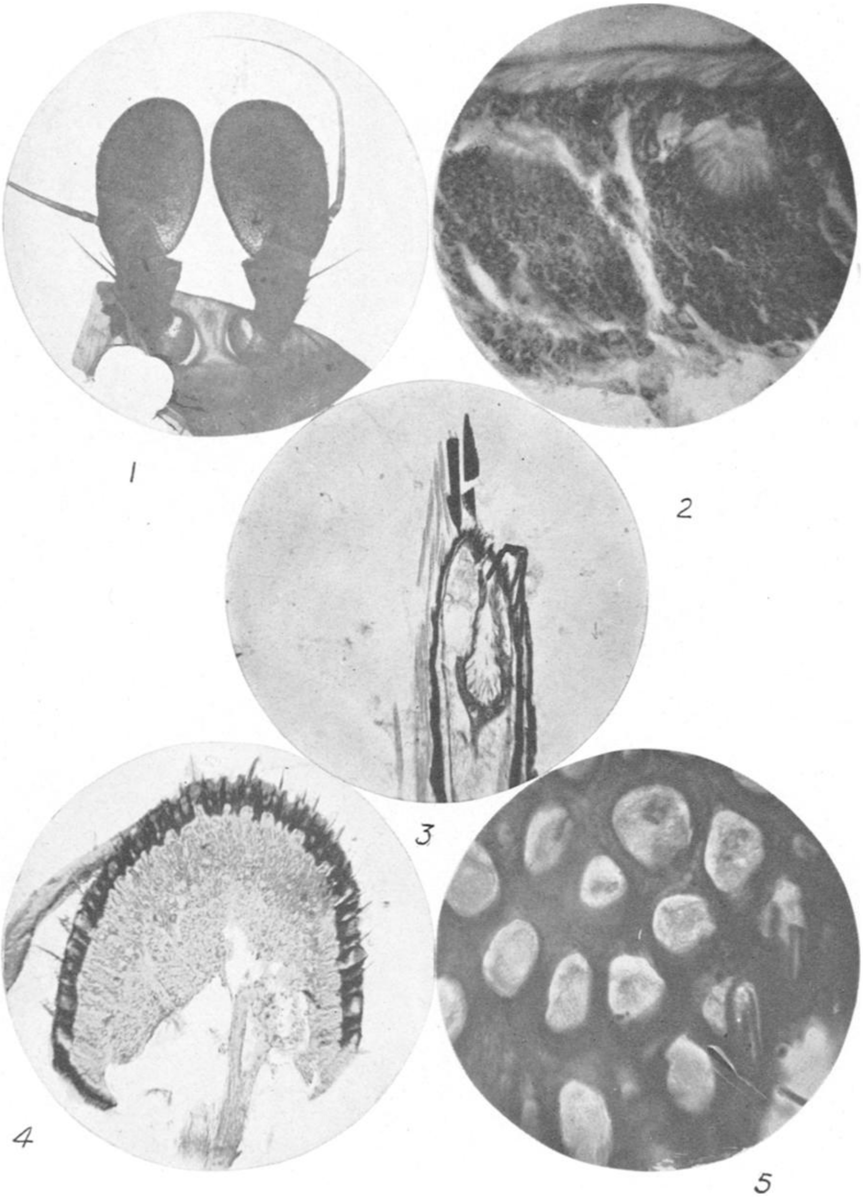
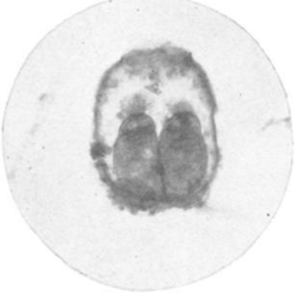


Plate XI



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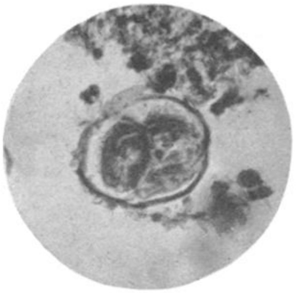

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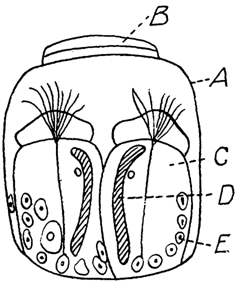

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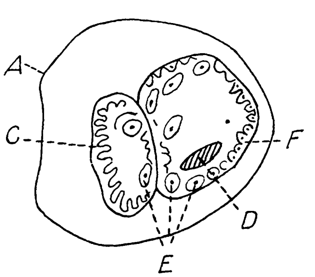

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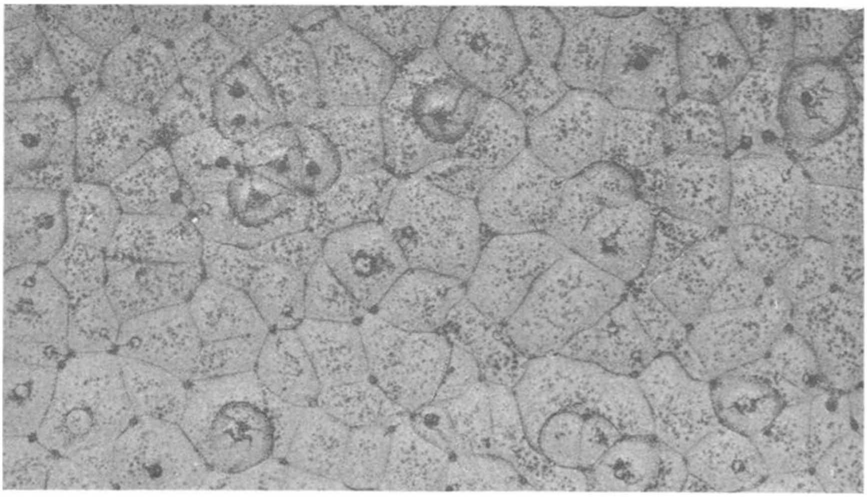

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PLATE XII